Hawai'i Division of Aquatic Resources

**Department of Land and Natural Resources (DLNR)**
**Division of Aquatic Resources (DAR)**
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# Frequently Asked Questions (FAQ) from Herbivore Scoping Sessions of December 2021

Three virtual scoping sessions were held on December 11th, 13th, and 15th of 2021 to discuss updates to the Statewide Herbivore Management Strategy, which is part of the Holomua: Marine 30x30 initiative to effectively manage Hawai'i's nearshore waters with 30% established as marine management areas by 2030. These updates included amendments to existing regulations and the proposal of new regulations as part of the Pono Practices pillar of Holomua. Frequently asked questions (FAQ) have been compiled and categorized from the scoping sessions and are provided in this document. Summary notes from the December 2021 scoping sessions can also be found on the Holomua website here.

## Justification and Scientific Data/Research:

**Why is DAR proposing additional or revised regulations for these species?** DAR is proposing these regulations to promote sustainability and effective management of nearshore resources (both herbivores and coral reefs), ensuring that there are plenty of these fish now and for future generations. The latest scientific research conducted in Hawai'i shows that there are fewer herbivores in places with higher human influences, which is most likely due to a combination of factors such as development, land-based sources of pollution, and fishing pressure[1]. When examining only targeted resource fish species (types of fish people like to eat), over half of the species in the Main Hawaiian Islands (MHI) had less than half the biomass in the Northwestern Hawaiian Islands[2]. While there can be several reasons contributing to these differences, it is plain to see that there are fewer herbivores and food fish here in the MHI. This highlights the need to manage and preserve our herbivore fish populations now, as they are an essential food source and play an important role in coral reef health. The species currently included in the proposal (uhu, kala, manini, and kole) serve key roles in maintaining coral reef health and are heavily targeted by fishing.

Species-specific regulations are based on stock assessments conducted in Hawai'i[3]. A stock assessment is the process of taking available scientific information pertaining to a specific stock or subpopulation of a species (for ex. kole populations only in Hawai'i) and running it through one or more mathematical models to determine how the stock responds to fishing pressure. Types of data that typically go into a stock assessment include fishery-based catch data, abundance data, and species-specific biological data. Stock assessments are an important tool

used by fishery managers to both determine the current condition of a fishery and to guide management actions seeking to restore or maintain stock health. Please refer to DAR's Sustainable Herbivore Management Plan for more details.

**Are the proposed rules based on the best available science, and is the research Hawai'i based?** Proposed regulations are based on the best available science conducted in Hawai'i. Several science-based factors are considered in these proposed rules, including Spawning Potential Ratios (SPR), fishing rates, and average size at maturity (L50). SPR is the percentage of the fish population that is able to effectively create eggs to reproduce, or a measure of current egg production relative to the potential egg production when a stock is not fished. L50 values, the length at which 50% of the fish have reached sexual maturity, are often used in fisheries stock management.

To determine the stock status of proposed species, fishing rates and SPR values were taken from a 2016 stock assessment of coral reef fishes in Hawai'i, conducted by the National Oceanic and Atmospheric Administration, Pacific Islands Fisheries Science Center[3]. L50 values for proposed species (kala, manini, kole, and uhu) were obtained from studies specifically conducted in Hawai'i as well[4,5,6,7]. Life history traits, reproductive sizes, spawning periods, and other species-specific information can be found in DAR's Sustainable Herbivore Management Plan. Catch data and stock assessment values can also be found in the plan. As new studies are published, DAR will incorporate updated information into the Management Plan and future management decisions. DAR is also prioritizing independent stock assessments to be conducted for species listed in the Management Plan that currently do not have stock assessments.

## Coral Reef/Fish Recovery Rates:

**How long may it take to see improvements or changes from these management regulations or strategies?** Recovery rates or how much time is needed to see effects from management strategies are often complicated and difficult to predict, because many factors affect recovery time, including the life history of the species, land-based influences affecting the area, climate change, restrictiveness of regulations, level of compliance, and strength of enforcement among others. Fish populations can take anywhere from 5-40 years to see recovery, depending on life history traits and other factors[8,9,10,11]. In addition, many scientific fish population recovery studies are based on data from no-take marine reserves; therefore, recovery may take longer for marine managed areas that allow some level of fishing. Coral reefs may take even longer, as most reef building corals in Hawai'i are slow growing. Recovery times will depend on the

severity of the event, for example, coral reef communities at Pila'a, Kaua'i are still not fully recovered 15 years after a sedimentation event[12]. It is important to keep in mind that many reefs may not recover to their pre-disturbance state. Difficult problems such as bleaching events and the increasing intensity and frequency of storms due to climate change and other human impacts may prevent corals from fully recovering.

## Aquarium and Commercial Fishing:

**How will the proposed regulations affect aquarium collection?** The proposed bag and size limits would apply to all gear types and for all purposes, including aquarium collection purposes. Currently, all commercial aquarium collection is prohibited by a Court order. Recreational aquarium collectors would have to comply with species size and bag limits.

**How will the proposed regulations affect commercial fishing?** The proposed bag and size limits would apply to both recreational and commercial fishers. While the rules do not prohibit commercial fishing or sale of these species, the proposed bag limits would have a greater adverse impact on full-time commercial fishers who target these species in high numbers than recreational fishers. The primary commercial gear types/methods that will be affected by the proposed rules are surround netting and night scuba spearfishing. DAR is only considering bag limits on uhu and kala at this time, and although this may have a negative impact on commercial fishers, the status of these fish stocks (especially kala) is unsustainable and urgently needs management intervention now.

## Types of Regulations/Methods:

**Why were seasonal or rotational closures not proposed during these sessions?** There is currently little support for using rotational closures to meet conservation or replenishment goals. One example of a rotational closure in Hawai'i is the Waikīkī-Diamond Head Fishery Management Area. Twenty years of data revealed some increases in fish during closures (1 to 2-year closure periods), but it was not enough to compensate for the declines during open seasons. In fact, there was an overall negative effect where total biomass declined by about two-thirds and there was a virtual disappearance of large fishes greater than 15 inches[13].

Closures during specific spawning periods may be useful, especially for species that form large schools or groups during spawning (preventing the catch of an entire spawning aggregation or many individuals in one trip/effort). However, while it may protect fishes during spawning, it

does not guarantee that they will live and grow to maturity post-closure without additional regulations. Although kapu and seasonal closures were used regularly by Native Hawaiians historically, they were done at the ahupua'a or moku (land unit or district) levels, and not at a larger statewide scale. Because there can also be variation in spawning seasons between places, seasonal closures for certain species and other more specific regulations will be considered for place-based planning and management efforts in the near future as part of Holomua: Marine 30x30, including through Community-Based Subsistence Fishing Areas (CBSFA).

**Can artificial reefs be used in Hawai'i to create more habitats for fish?** The State of Hawai'i has five artificial reefs on O'ahu and Maui, and multiple fish aggregating devices (FADS) throughout in cooperation with the University of Hawai'i's Hawai'i Institute of Marine Biology. Artificial reefs (AR) are becoming more popular in conservation and restoration efforts, and are currently being explored as a fisheries management tool to aid in the rehabilitation of degraded ecosystems and as a mitigation tool for vessel groundings and other direct impacts that damage coral reefs. Research studies examining the effectiveness of ARs here in Hawai'i are mixed, and can be interpreted in multiple ways depending on the management objectives[14,15,16]. Species diversity on ARs are not always comparable to natural reefs. Since managing and preserving natural coral reefs is a main priority, identifying the management goals and desired outcomes of any newly proposed AR sites will need to be evaluated on an individual basis to assess whether they might be an effective solution. Cost and permitting are also limiting factors to be considered in future plans to expand existing AR sites and to add more ARs around the Main Hawaiian Islands. More information on ARs can be found here.

**Why weren't bag limits proposed during these sessions for manini and kole?** Bag limits were not proposed for manini and kole during our December 2021 scoping sessions (only size limits were proposed) due to a number of participants expressing opposition in our previous scoping sessions held in November of 2020 and March of 2021 (please find summary notes from these sessions here at the bottom of the page). DAR decided to temporarily pause bag limit proposals for these species while additional research is conducted to assess the species' stock status, which will inform future regulations and management strategies. We remain open to implementing bag limits on a place-based scale, as appropriate in the future, and will re-consider statewide bag limits upon completion of further analyses.

**Will the regulations be permanent, or can they be adjusted later if populations rebound?** The goal of statewide herbivore regulations is to ensure sustainable fish populations for both fishers and reef health. If populations rebound and the science suggests that regulations can be modified while continuing to achieve sustainability goals, DAR will consider adjusting

regulations. This approach is known as *adaptive management*. However, it is important to understand that recovery on a statewide level may take a long time, even decades, especially when some level of fishing is still allowed. Please refer to the Coral Reef/Fish Recovery Rates section above for more details.

## Enforcement/DOCARE:

**What is the point of all these regulations if there isn't enough enforcement? What is being done to improve enforcement and compliance?** Concerns regarding the need to improve the strength and capacity of enforcement were raised several times during the scoping sessions. DAR works closely with DLNR's Division of Conservation and Resources Enforcement (DOCARE), the division directly responsible for enforcement and violations, when developing and proposing new rules to ensure their enforceability. Fines for illegal fishing can range anywhere from $100 to $1,000 per violation. For example, the taking of five undersized fish could be five violations and fines up to $5,000.

To enhance enforcement and outreach, DOCARE is growing; in December 2021, 46 enforcement officer positions were open for recruitment. As a part of the Holomua: Marine 30x30 initiative, DLNR is taking steps to build DOCARE's staffing capacity, and also working towards increasing public education and engagement through the DLNRTip App and expansion of the Makai Watch program, which partners with local communities to provide training on how community members can volunteer to take active roles in identifying violations and in promoting compliance to rules, education, and monitoring.

## Climate Change & other Mauka-Based Impacts:

**What is DAR doing to address land-based impacts upstream and the effects of climate change?** While DAR's kuleana and jurisdiction is specifically to manage, conserve and restore our aquatic resources through fisheries management/regulations and restoration, we understand that land-based problems do play a major role in the degradation of our coastal areas. Tackling these issues requires coordination and collaboration with many different government agencies and non-governmental organizations. DAR collaborates and engages in many efforts to address habitat declines, including reef restoration through outplanting corals from our coral nursery, and raising and outplanting sea urchins to combat invasive algae. DAR also funds a watershed coordinator on Maui and supports watershed and stream restoration at places such as the He'eia National Estuarine Research Reserve and the Honouliuli watershed on O'ahu. DAR is an active

member of the South Kohala Coastal Partnership and the West Maui Ridge to Reef Initiative, which are both designed to help preserve and protect coral reefs from land-based impacts including pollution, sedimentation, and climate change. To learn more about our efforts in ma uka to ma kai restoration, please visit the DLNR's Coral Reefs website.

Unfortunately there is no easy solution to climate change, as this challenge will require a massive global effort, but DAR acknowledges the threat and took the lead in developing the State of Hawai'i's Ocean Acidification Action Plan in collaboration with multiple state agencies and community organizations to combat our ocean's changing chemistry. We are also taking steps to identify which of our reefs are resilient in the face of climate change and increasing temperatures, and incorporating that knowledge into the planning of marine managed areas for the Holomua: Marine 30x30 initiative so that we may protect these resilient reefs. Managing herbivorous fish will also help to protect our reefs from climate change by contributing to resilience, as herbivores will graze and keep the algae populations in control so that new corals are able to settle and grow after disturbances such as bleaching events. To combat land-based threats, climate change, and fishing pressure that are contributing to habitat degradation, our state needs a comprehensive management approach that encompasses both ma uka and ma kai management strategies.

## References


1. Donovan, M. K., Donahue, M. J., Counsell, C., Lecky, J., Gajdzik, L., Marcoux, S. D., Sparks, R. T., Teague, C., & Neilson, B. J. Managing herbivores for reef resilience. (Manuscript in preparation).

2. Friedlander, A. M., Donovan, M. K., Stamoulis, K. A., Williams, I. D., Brown, E. K., Conklin, E. J., DeMartini, E. E., Rodgers, K. S., Sparks, R. T., & Walsh, W. J. (2017). Human-induced gradients of reef fish declines in the Hawaiian Archipelago viewed through the lens of traditional management boundaries. Aquatic Conservation: Marine Freshwater Ecosystems 28, 146–157.

3. Nadon, M. O. (2017). Stock assessment of the coral reef fishes of Hawaii, 2016. US Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Pacific Islands Fisheries Science Center.

4. DeMartini, E. E., & Howard, K. G. (2016). Comparisons of body sizes at sexual maturity and at sex change in the parrotfishes of Hawaii: input needed for management regulations and stock assessments. Journal of fish biology, 88(2), 523-541.

5. Schemmel, E., Friedlander, A. M., Andrade, P., Keakealani, K., Castro, L. M., Wiggins, C., Wilcox, B., Yasutake, Y., & Kittinger, J. N. (2016). The codevelopment of coastal fisheries monitoring methods to support local management. Ecology and Society, 21(4).

6. Langston, R., Longenecker, K., & Claisse, J. (2009). Growth, mortality and reproduction of kole, *Ctenochaetus strigosus*. Hawaii Biological Survey Contribution, 5, 25.

7. DeMartini, E. E., Langston, R. C., & Eble, J. A. (2014). Spawning seasonality and body sizes at sexual maturity in the bluespine unicornfish, *Naso unicornis* (Acanthuridae). Ichthyological Research, 61(3), 243-251.

8. Williams, I. D., White, D. J., Sparks, R. T., Lino, K. C., Zamzow, J. P., Kelly, E. L., & Ramey, H. L. (2016). Responses of herbivorous fishes and benthos to 6 years of protection at the Kahekili Herbivore Fisheries Management Area, Maui. PloS one, 11(7), e0159100.

9. Abesamis, R. A., Green, A. L., Russ, G. R., & Jadloc, C. R. L. (2014). The intrinsic vulnerability to fishing of coral reef fishes and their differential recovery in fishery closures. Reviews in Fish Biology and Fisheries, 24(4), 1033-1063.

10. Hutchings, J. A., & Reynolds, J. D. (2004). Marine fish population collapses: consequences for recovery and extinction risk. BioScience, 54(4), 297-309.

11. Russ, G. R., & Alcala, A. C. (2004). Marine reserves: long-term protection is required for full recovery of predatory fish populations. Oecologia, 138(4), 622-627.

12. Rodgers, K. S., Donà, A. R., Stender, Y. O., Tsang, A. O., Han, J. H. J., Weible, R. M., ... & Graham, A. T. (2021). Rebounds, regresses, and recovery: A 15-year study of the coral reef community at Pila'a, Kaua'i after decades of natural and anthropogenic stress events. Marine Pollution Bulletin, 171, 112306.

13. Williams, I. D., Walsh, W. J., Miyasaka, A., & Friedlander, A. M. (2006). Effects of rotational closure on coral reef fishes in Waikiki-Diamond head fishery management area, Oahu, Hawaii. Marine ecology progress series, 310, 139-149.

14. Fukunaga, A., & Bailey-Brock, J. H. (2008). Benthic infaunal communities around two artificial reefs in Mamala Bay, Oahu, Hawaii. Marine Environmental Research, 65(3), 250-263.

15. Jones, S. T., Asher, J. M., Boland, R. C., Kanenaka, B. K., & Weng, K. C. (2020). Fish biodiversity patterns of a mesophotic-to-subphotic artificial reef complex and comparisons with natural substrates. PloS one, 15(4), e0231668.

16. Moffitt, R. B., Parrish, F. A., & Polovina, J. J. (1989). Community structure, biomass and productivity of deepwater artificial reefs in Hawaii. Bulletin of Marine science, 44(2), 616-630.